Course Outline

Instructor
- Prof. Cyrus Shafai, P.Eng.
  E1–534 EITC
  (204) 474–6302
  Cyrus.Shafai@umanitoba.ca

Office Hours
- Monday, Wednesday, Friday
  after class, or by appointment

Teaching Assistant
- Sara Albasan
  umabsala@myumanitoba.ca
- Mehdi Allameh
  allamemm@myumanitoba.ca

Contact Hours
- 4 credit hours
- Lectures:
  3 hours x 13 weeks = 39 hours
- Laboratories:
  3 hours x 5 weeks = 15 hours

Prerequisites:
- ECE 3670 Electronics 3

Course Website:
- http://umanitoba.ca/umlearn

Important Dates
- Term Tests
  Monday, February 22nd, 2021 (in class)
  Monday, March 22nd, 2021 (in class)
- Voluntary Withdrawal Deadline
  March 31st, 2021
- Louis Riel Day
  February 15th, 2021
  No classes or examinations
- Spring Break
  February 16th – 19th, 2021
  No classes or examinations
- Good Friday
  April 2nd, 2021
  No classes or examinations

ECE 4100 - Introduction to Microelectronic Fabrication  Winter 2021

IMPORTANT NOTICE – Mandatory Requirement to Report
This course will be conducted using remote instruction. Students who are accessing the course from outside of Canada or the USA must notify the instructor and indicate in which country they are located. Access to software may be restricted from some countries and failure to comply with these restrictions may result in criminal prosecution.

Course Objectives
This course introduces students to the various technologies used in the fabrication of integrated circuits (ICs). Emphasis is on silicon based devices. Topics include wafer preparation, oxidation, thin film deposition, diffusion and ion implantation, lithography, wet and dry etching, and metallization. The application of these topics to CMOS, Bipolar, and GaAs devices is discussed.

Course Content
The following topics will be covered:
- Introduction to Microelectronic Fabrication
- Silicon and GaAs Substrates
- Oxidation and Doping
- Pattern Transfer
- Thin Film Deposition
- Process Integration
- Introduction to Micromachining and MEMS.

Textbook

Learning Outcomes
1. Familiarity with semiconducting materials, atomic structure, and doping process.
2. Understand and apply lithographic and etching techniques.
3. Understand and apply thin film deposition technologies.
4. Familiarity with microelectronic device design and structure.
5. Familiarity with MEMS design and structure.

Expected Competency Levels

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<tr>
<th>Outcome</th>
<th>KB</th>
<th>PA</th>
<th>IN</th>
<th>DE</th>
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CEAB Graduate Attributes Assessed
PA.2 – Develops and/or implements a strategy to analyze complex engineering problems.
IN.4 – Understands appropriate safe work procedures during experiments or laboratory exercises.
The instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.

### Evaluation

The final course grade will be determined from a student's performance in laboratories, assignments, and on examinations. Programmable calculators are not allowed in the mid-term and final examination. Students must receive a minimum of 50% on the final examination and must complete all the laboratories in order to be eligible to receive a passing grade.

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<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<td>Assignments</td>
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<td>F, S</td>
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<td>Final Examination</td>
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* Method of Feedback: F - Formative (written comments and/or oral discussion), S - summative (numerical grade)

### Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g., suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

### Requirements/Regulations

- **Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a passing final grade.**
- **It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.**
- **No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, smart watches, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.**
- **Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.**

### Copyright Notice

All materials provided in this course are copyright and are provided under the fair dealing provision of the Canadian Copyright Act. This material may not be redistributed in any manner without the express written permission of the relevant copyright holder.

### Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University’s Intellectual Property Policy and the protection of privacy provisions of The Freedom of Information and Protection of Privacy Act (Manitoba). Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.